

(12) UK Patent Application

(19) GB (11) 2 233 499 (13) A

(43) Date of A publication 09.01.1991

(21) Application No 9013635.9

(22) Date of filing 19.06.1990

(30) Priority data  
(31) 01166052 (32) 28.06.1989 (33) JP  
01174561 06.07.1989  
02066649 16.03.1990

(51) INT CL<sup>s</sup>  
H01H 13/52

(52) UK CL (Edition K)  
H1N NUJB N448 N618 N625 N649 N652 N700  
N705 N717 N854  
H1S SBK S6A3 S9A5 S9D1

(56) Documents cited  
GB 2180994 A GB 1562264 A EP 0063851 A1

(71) Applicant  
Mitsubishi Denki Kabushiki Kaisha  
  
(Incorporated in Japan)

(58) Field of search  
UK CL (Edition K) H1N NBH NUJB, H1S SBK  
INT CL<sup>s</sup> H01H

2-3 Marunouchi 2-chome, Chiyoda-ku,  
Tokyo, Japan

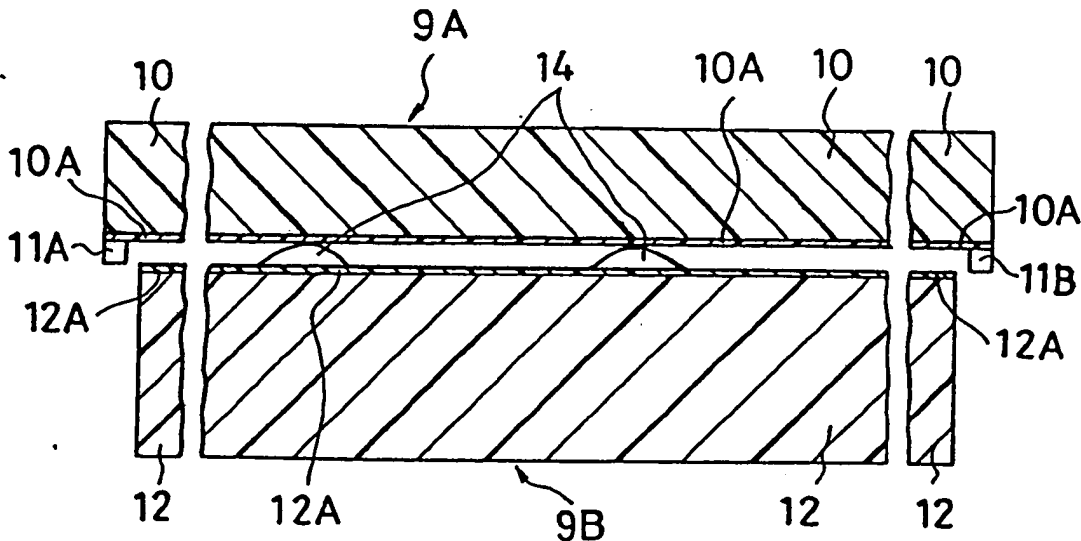
(74) Agent and/or Address for Service  
Beresford & Co  
2-5 Warwick Court, High Holborn, London,  
WC1R 5DJ, United Kingdom

(72) Inventors  
Kiyosi Yagita  
Masahisa Kobukuro

(54) Switch

(57) A switch comprises a first electrode composed of a non-conductive flexible film (10) having a conductive film (10A) on one surface and a second electrode composed of a non-conductive film (12) having a conductive film (12A) on one surface facing the first electrode and a plurality of insulative spacers (14) mounted on at least one of the electrodes. The spacers (14) are of very small dimension - lateral dimensions of 50 μm or less and a height of 15 μm or less, whereby the insensitive zone areas of the switch are of reduced size. The spacers (14) may be formed from a photoresist. A protective coating of plastics containing metal or metal oxide particles may be formed upon the conductive film (10A). In a further embodiment, the conductive films (10A, 12A) are coated with resistance layers of plastics containing metal or metal oxide particles and metal coated transparent balls of 5-10 μm diameter.

FIG. 1



GB 2 233 499 /

## TITLE OF THE INVENTION

Sheet-like switch

## FIELD OF THE INVENTION AND RELATED ART STATEMENT

### 1. FIELD OF THE INVENTION

The present invention relates generally to a sheet-like switch, and more particularly to a sheet-like switch which is activated by pushing the surface of the sheet-like switch with a sharp-pointed member such as a ball-point pen.

### 2. DESCRIPTION OF THE RELATED ART

An example of a conventional sheet-like switch is shown in "Nyuryoku-sohchi kaihatsu, sekkei, ohyo no yoten" ("The point of research, design, application of an input equipment" Page 170) which is published by Japan Industry Engineering Center.

The configuration of the conventional sheet-like switch is shown in FIG.10. Referring to FIG.10, a transparent and flexible first non-conductive film 1 has a transparent conductive film 1A of a thin metal film or a metal oxide film on one surface thereof, and terminals 2A and 2B which are connected to the conductive film 1A at both end parts are mounted on the first non-conductive film 1. A second non-conductive film 3 is provided to face to the surface of the conductive film 1A of the first non-conductive film 1. The second non-conductive film 3 is preferable to be made of a transparent hard glass

**WHAT IS CLAIMED IS**

1. A sheet-like switch comprising:

... a first sheet-like electrode composed of a non-conductive flexible film having a conductive film on a surface thereof,

a second sheet-like electrode composed of a non-conductive film having a conductive film on a surface thereof facing said conductive film of said first sheet-like electrode, and

a plurality of non-conductive spacers of 50  $\mu$ m or less in diameter and 15  $\mu$ m or less in height mounted on at least one of said first and second sheet-like electrodes.

2. A sheet-like switch comprising:

a first sheet-like electrode composed of a non-conductive flexible film having a conductive film on a surface thereof and a conductive coating of plastics containing fine metal particles or metal oxide particles coated on said conductive film,

a second sheet-like electrode composed of a non-conductive film having a conductive film on a surface thereof and a plurality of non-conductive spacers mounted on said conductive film with a predetermined interval, and arranged facing said conductive film of said first sheet-like electrode.

3. A sheet-like switch comprising:

a first sheet-like electrode composed of a non-conductive flexible film having a conductive film of a metal or metal oxide thin film on a surface thereof, a resistance layer of plastics containing fine metal particles or metal oxide particles and transparent balls of 5 to 10  $\mu\text{m}$  diameter having a thin metal film on the surface thereof coated on the surface of said conductive film and a plurality of spacers of mounted on said resistance layer with a predetermined interval,

a second sheet-like electrode composed of a non-conductive film having a conductive film of a metal or metal oxide thin film on a surface thereof, a resistance layer of plastics containing fine metal particles or metal oxide particles and transparent balls of 5 to 10  $\mu\text{m}$  diameter, having a thin metal film on the surface thereof, coated on the surface of said conductive film, and a plurality of spacers mounted on said resistance layer with a predetermined interval, arranged facing said conductive film of said first sheet-like electrode.

4. A sheet-like switch in accordance with claim 3, wherein

said resistance layer on the conductive film of said second non-conductive film is partially formed on said conductive film, and said spacer is mounted on said each resistance layer.

5. A sheet-like switch in accordance with claim 3,

wherein

said resistance layer on the conductive film of said first non-conductive flexible film is formed partially on said conductive film, and said spacer is mounted on each of said resistance layer,

said resistance layer on the conductive film of said second non-conductive film is formed partially on said conductive film, and said spacer is mounted on each of said resistance layer.

6. A sheet-like switch in accordance with claim 1, 2 or 3, wherein

said non-conductive flexible film of said first sheet-like electrode and said non-conductive film of said second sheet-like electrode are transparent.

7. A sheet-like switch in accordance with claim 1, 2 or 3, wherein

said conductive film is transparent.

8. A sheet-like switch in accordance with claim 2, wherein

said conductive coating is transparent.

9. A sheet-like switch in accordance with claim 3, wherein

said resistance layer is transparent.

10. A sheet-like switch comprising:  
first and second sheet-like electrodes;  
and  
a plurality of insulative spacers  
5 interposed between said electrodes; wherein  
said spacers have lateral dimensions of 50  
 $\mu\text{m}$  or less and a height of 15  $\mu\text{m}$  or less.

11. A switch as claimed in claim 10, wherein  
10 said spacers are formed of photoresist material.

12. A sheet-like switch comprising:  
first and second sheet-like electrodes;  
a plurality of insulative spacers  
15 interposed between said electrodes; and  
a protective coating comprised of  
conductive particles embedded in a binding matrix  
material formed upon the surface of at least one of  
said first and second sheet-like electrodes.

20

13. A switch as claimed in claim 12, wherein  
said coating includes a distribution of  
conductive-film coated balls.

14. A method of producing a sheet-like switch wherein:

5 a layer of photoresist is deposited upon the surface of a sheet-like electrode and is photolithographically defined to form a plurality of insulative spacers having lateral dimensions of 50  $\mu\text{m}$  or less and a height of 15  $\mu\text{m}$  or less.

10 15. A sheet-like switch constructed, adapted and arranged to operate substantially as described hereinbefore with reference to and as shown in Figures 1 to 9 of the accompanying drawings.

FIG. 1

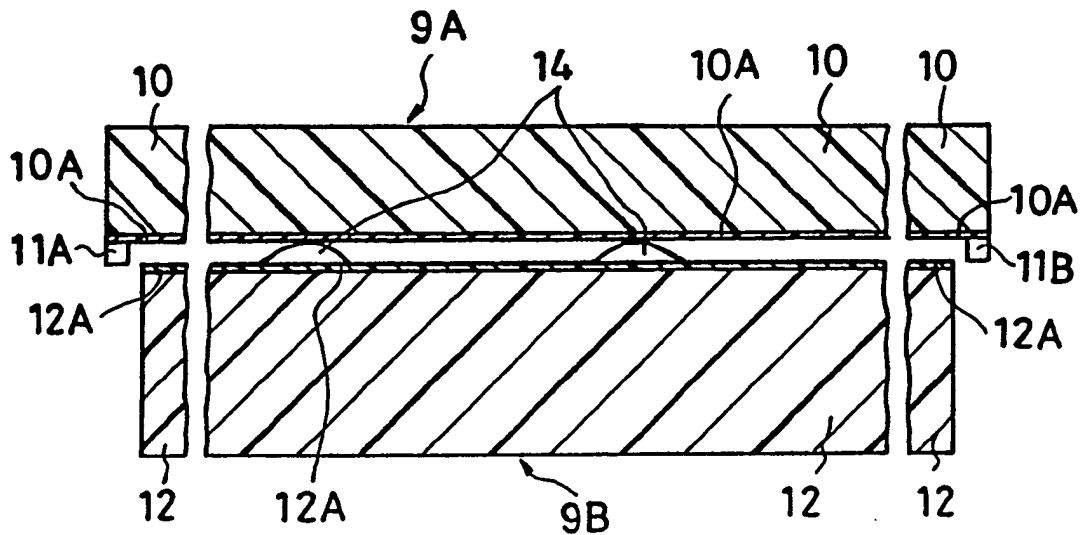


FIG. 2

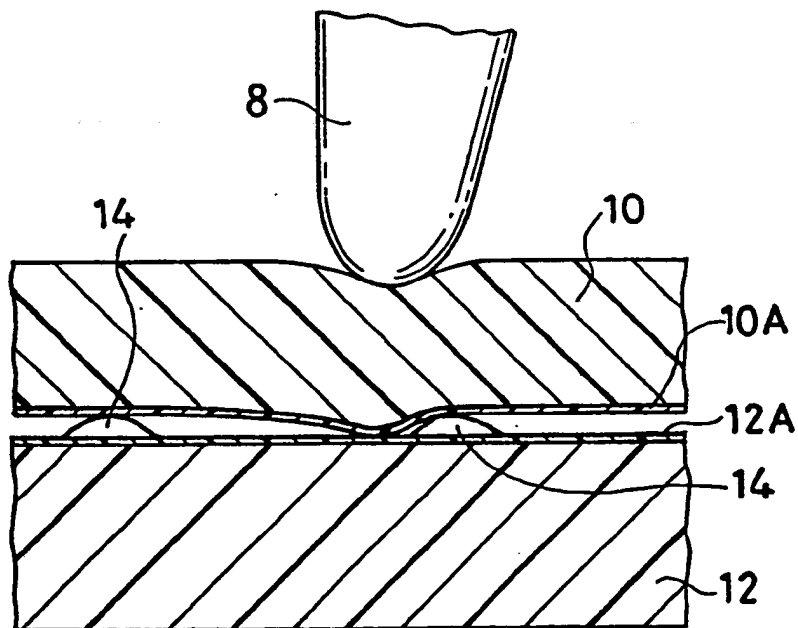




FIG. 3

